

SECTION 23 36 00
AIR TERMINAL UNITS

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Delete between// // if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraph.
3. References to pressure in this section are gage pressure unless otherwise noted.
4. Coordinate spec with applicable VA Standard details and equipment schedules:
 - a. 23 36 00-04 Duct Connection-Air Terminal Units

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Air terminal units.
- B. A complete listing of common acronyms and abbreviations are included in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

1.2 RELATED WORK

SPEC WRITER NOTE: Retain one of two paragraphs below.

- A. //Section 01 00 01, GENERAL REQUIREMENTS (Major NCA Projects).//
- B. //Section 01 00 02, GENERAL REQUIREMENTS (Minor NCA Projects).//
- C. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- D. Section 01 42 19, REFERENCE STANDARDS.
- E. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
- F. //Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.//
- G. Section 23 05 11, COMMON WORK RESULTS FOR HVAC: General mechanical requirements and items which are common to more than one section of Division 23.
- H. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT: Noise requirements.
- I. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC: Flow rates adjusting and balancing.
- J. //Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//
- K. //Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Damper actuators.//

L. Section 23 31 00, HVAC DUCTS AND CASINGS: Ducts and flexible connectors.

1.3 APPLICABLE PUBLICATIONS

SPEC WRITER NOTE: Make material requirements agree with requirements specified in the referenced Applicable Publications. Verify and update the publication list to that which applies to the project, unless the reference applies to all mechanical systems. Publications that apply to all mechanical systems may not be specifically referenced in the body of the specification, but, shall form a part of this specification.

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Air-Conditioning, Heating, and Refrigeration Institute (AHRI)
880-2011.....Performance Rating of Air Terminals
- C. National Fire Protection Association (NFPA):
90A-2015.....Standard for the Installation of Air-
Conditioning and Ventilating Systems
- D. Underwriters Laboratories, Inc. (UL):
181-2013.....Standard for Factory-Made Air Ducts and Air
Connectors

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 23 36 00, AIR TERMINAL UNITS", with applicable paragraph identification.
- C. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
- D. Certificates:
 - 1. Compliance with paragraph, QUALITY ASSURANCE.
 - 2. Compliance with specified standards.

- E. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replacement parts, and troubleshooting guide:
 1. Include complete list indicating all components of the systems.
 2. Include complete diagrams of the internal wiring for each item of equipment.
 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.
- F. //Completed System Readiness Checklist provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//
- G. //Submit training plans and instructor qualifications in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//

1.5 QUALITY ASSURANCE

- A. Refer to paragraph, QUALITY ASSURANCE, in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

1.6 AS-BUILT DOCUMENTATION

SPEC WRITER NOTE: Coordinate O&M Manual requirements with Section 01 00 01, GENERAL REQUIREMENTS (Major NCA Projects) or Section 01 00 02, GENERAL REQUIREMENTS (Minor NCA Projects). O&M manuals shall be submitted for content review as part of the close-out documents.

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be //in electronic version on CD or DVD// inserted into a three ring binder. All aspects of system operation and maintenance procedures, including applicable piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the

owner will be required to employ shall be inserted into the As-Built documentation.

- C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them in Auto-CAD version //____// provided on CD or DVD. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.
- D. Certification documentation shall be provided to COR 10 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and certification that all results of tests were within limits specified.

PART 2 - PRODUCTS

2.1 AIR TERMINAL UNITS (BOXES)

- A. General: Factory built, pressure independent units, factory set, field adjustable air flow rate, suitable for single duct applications, as indicated. Clearly show on each unit the factory set air volumes. Coordinate flow controller sequence and damper operation details with the drawings// and Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC//.
- B. Rating and Performance Certification: Terminal units certified by AHRI 880 Air Terminals, and bear the AHRI seal.
 - 1. Maximum pressure drop: As shown on the drawings.
 - SPEC WRITER NOTE: Low-pressure duct is usually unlined. The inlet pressure should not be less than 374 Pa (1-1/2 inches water gage).
 - 2. Maximum room sound levels: Not to exceed criteria stated in Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT unless shown otherwise on drawings. Provide terminal sound attenuators where necessary to comply with the noise criteria. Sound tests and correction of deficiencies is specified in Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC.

SPEC WRITER NOTE: Provide maximum allowable sound discharge levels on air

terminal unit equipment schedules.
Specify sound attenuators where
necessary.

- C. Casing: Unit casing shall be constructed of galvanized steel not lighter than 0.85 mm (22 gage) or aluminum sheet not lighter than 1.3 mm (18 gage). Provide hanger brackets for attachment of supports.
1. Lining material: Suitable to provide required acoustic performance, thermal insulation, and to prevent sweating. Meet the requirements of NFPA 90A and comply with UL 181 for erosion. Insulation consisting of 15 mm (1/2 inch) thick non-porous foil-faced rigid fiberglass insulation of 4 lb/cu. ft., secured by full length galvanized steel z-strips which enclose and seal all edges. Tape and adhesives are prohibited. Comply with UL 181 for erosion. Surfaces, including all edges, faced with perforated metal or coated so that the air stream will not detach material.
 2. Total leakage from casing: Not to exceed 2 percent of the nominal capacity of the unit when subjected to a static pressure of 747 pa (3 inch WG), with all outlets sealed shut and inlets fully open.
 3. //Multiple Outlet Connector: Factory installed, lined air distribution terminal. Provide where flexible duct connections are shown on the drawings connected directly to terminals. Provide butterfly-balancing dampers, with locking means in connectors.//
- D. Construct dampers and other internal devices of corrosion resisting materials which do not require lubrication or other periodic maintenance.
1. Damper Leakage: Not greater than 2 percent of maximum rated capacity, when closed against inlet static pressure of 1 kPa (4 inch WG).
- E. Provide multi-point velocity pressure sensors with external pressure taps.
1. Provide direct reading air flow rate table pasted to box.
- F. Provide static pressure tubes.
- G. Ensure factory has calibrated air terminal units to air flow rates indicated. All settings including maximum and minimum air flow to be field adjustable.
- H. Provide sound attenuators where scheduled. Attenuators to be as specified in Section 23 31 00, HVAC DUCTS AND CASINGS.

SPEC WRITER NOTE: Specify DDC controls
for terminal units only when related DDC

controls are specified under Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC, and edit Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC for 100 percent DDC controls.

I. //Externally powered DDC variable air volume controllers and damper actuators shall be furnished under Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC for factory mounting on air terminal units.//

J. Fan powered terminal units:

1. Fan assembly: Forward curved centrifugal direct drive blower with multi-speed permanent split capacitor motor or adjustable speed controller.

a. Motor: Integral thermal overload protection.

SPEC WRITER NOTE: Schedule motor voltage.

1) //115 V single phase.//

2) //208/240 V single phase.//

3) //277 V single phase.//

b. Motor assembly: Completely isolated from cabinet with rubber vibration mounts.

2. Provide non-fused disconnect on each terminal unit.

3. //Electric heater manufactured by the terminal unit manufacturer. Heater hinged access panel for entry to the controls. Furnish power disconnect and fusing.//

K. Terminal Sound Attenuators: Construction similar to sound attenuators in Section 23 31 00, HVAC DUCTS AND CASINGS.

PART 3 - EXECUTION

3.1 INSTALLATION

A. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

B. Install as shown and according to the manufacturer's diagrams and recommendations.

C. Handle and install units in accordance with manufacturer's written instructions.

D. Support units rigidly so they remain stationary at all times. Cross-bracing or other means of stiffening shall be provided as necessary. Method of support such that distortion and malfunction of units cannot occur.

- E. Locate air terminal units to provide a straight section of inlet duct, as recommended by approved manufacturer, for proper functioning of volume controls.

3.2 STARTUP AND TESTING

- A. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.
- C. //The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the COR and Commissioning Agent. Provide a minimum notice of 10 working days prior to startup and testing.//

3.3 // COMMISSIONING

- A. Provide commissioning documentation in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.
- B. Components provided under this section of the specification will be tested as part of a larger system.//

3.4 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for //four// // // hour//s// to instruct each VA personnel responsible in the operation and maintenance of units.
- B. //Submit training plans and instructor qualifications in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//

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